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SHORT-WAVE THERAPY IN GYNECOLOGY AND OBSTETRICS

Experiences With One Hundred Twenty Cases

Edward G. Waters, M.D., Ph.B., F.A.C.S., Jersey City, N. J.
(From the Margaret Hague Maternity Hospital)

THE application and use of oscillatory electrical current of various frequencies in the different fields of medicine and surgery has been an extremely interesting excursion to watch. That it has been of value is attested by its steadily increasing application and various attempts to augment the scope of the differing physical procedures already in use. Within recent years waves of very high frequency, variously known as short wave, ultra-short wave, radiothermy, etc., have largely supplanted the interest in diathermy. It is rather obvious from the literature that some of the over-enthusiastic operators have confused therapeutic claims with indisputable results, but in spite of this rather human trait it is important that we evaluate this convenient and seeming practical method for producing deep-seated heat in any part of the body. Although claims have been made, notably by foreign writers, that the short-wave current produces physiologic effects other than heat, it has been difficult, in fact essentially impossible, to prove such statements. Therefore, while one may not forthwith dismiss the possibility that other effects are produced by such treatment, it is safest to assume that beneficial results are derived from the heat created, and solely from the heat.

An understanding of the basic principles underlying the application of this form of therapy is important in considering the manner in which the effects are produced. The temperature rise is caused by the flow of short-wave current within the body. The wave in its passage, if it be an alternating or oscillating current, dissipates energy and produces heat. This can be explained by the manner of the electrical or molecular disturbance which takes place under the influence of the impressed voltage. As the current flows, the molecules are distorted, first in one direction and then the other; in effect, there is a vibration of these molecules, the vibratory rate being at the same frequency as the oscillating rate of the applied current and the intermolecular friction caused by this motion produces heat in the mass of tissues.

With ordinary diathermy current, the vibrations take place at the rate of only 600,000 to 1,000,000 per second, and because of this rela-

tively low oscillatory rate, direct metallic skin contacts are required to introduce the energy into the body.

But when currents of extremely high frequencies are applied, such as those of short-wave length, the displacement of vibratory rate of the molecules will run from 12½ to 30 million per second. Because of this very high frequency, we are able to introduce the current into the body without direct metallic contact.

In actual application of short-wave currents, there are two methods of introducing the energy into the body. One is commonly known as the condenser field method (pads) and the other as the magnetic field (inductance cable).

With the condenser field method, the metallic element in the insulated applicator pads is separated from the patient's skin by rubber or other insulation, and these metal plates together with the patient's skin form a condenser of small capacity. This small capacity would offer a tremendous impedance (or resistance) to the relatively long-wave lengths, such as are used in medical diathermy and such current would not flow. However, when the frequency is high enough (10 million or more oscillations per second) these capacities or condensers offer a negligible impedance, and the current flows freely from the metal plates through the insulating materials to the patient's skin, then through the intervening tissues, and out through the other condenser pad. Heat is created in the intervening tissue structures through the molecular activities engendered, as previously described.

If we remember that the human body consists of a multiplicity of cells of varying electrical characteristics, it may be reasonably considered to form many minute condensers, often with resistances in series and in parallel. Thus, when dealing with a short-wave current, one may assume that once introduced into the body, the current will divide itself between resistive and capacitative paths and that the heat so created may be partly attributed to combinations of effects, viz., first a resistive heating in the resistive paths plus heating due to losses in many minute condensers.

We can visualize further freest passage of these currents through paths of low resistance, such as muscle, the vascular organs of the viscera, and the immediate subcutaneous tissues with their free peripheral circulation, and we can visualize that the current will tend to jump around or over the highly resistive tissues, such as bone, cartilage, fascia, etc., due to the condenser effect induced by these semi-insulators.

With the assumption that the freest current flow will take place in the good conductors (that is, the highly vascular moist tissues, the blood stream, etc.), whereas lesser current will flow in the semi-insulating tissues, we may presume that currents of very short-wave length (or very high frequency) will tend to seek out and flow freest through the

most conductive structures. This may explain the apparent localization and beneficial effect on infected areas where edema or high aqueous content would create a low resistance, highly conductive path.

As previously stated, with the condenser field method, the current must flow from one applicator through all intervening structures and out through the second applicator. This is somewhat at variance with the second method of introducing short-wave currents into the body, viz., the so-called magnetic field or inductance cable applicator.

With the cable, heating is effected not by current passing through the body, but rather by the flow of secondary current induced in the body as the current flows in the coiled-up cable near or on the mass of tissue being treated.

Current from the generator is conducted through a flexible, heavily insulated cable which is either wound around the part to be treated or placed in the form of a flat "pancake" over the tissue where heat is desired.

Within the coiled cable, an alternating magnetic flux is set up by passage of the current. When a conductive body is placed in or near the coil, an electromagnetic force is induced which causes eddy currents of the same frequency as the current in the cable to flow in conductive parts of the body mass.

These eddy currents do not have to flow *through* intervening structures, but rather will they circulate within the various tissues. The greatest current will tend to flow and consequently greatest heat will be produced in the more conductive structures, without unduly heating the skin. Because of its flexibility and ease of application, the cable is found extremely convenient in treating irregular contours of the body such as a shoulder, neck, joints, etc., where physical structure makes application of the condenser pads difficult.

These two methods are described because one will be found more convenient for certain applications. It is doubtful if there is any therapeutic difference in the effects produced.

While I have spoken of the tendency to create greatest heat in the tissues of greatest conductivity, it is doubtful if practical differential heating can be accomplished and controlled due to the temperature equalizing effects in the tissues of heat conductivity and blood flow. In practice, one must assume that all body structures, lying between the plates of the condenser applicators or within the field of the inductance cable, must have temperature elevations of varying degree and duration.

Our interest in the possibilities of short-wave therapy in obstetrics and gynecology was aroused by its presumed ability to produce heat for conditions and in locations otherwise inaccessible to it in the usual form. In the several conditions herein reported it had long been felt

TABULATION OF CASES

DIAGNOSIS	NO. CASES	DAYS TREATED		AVERAGE NO. DAYS	NO. TREATMENTS		AVERAGE NO. TREAT.	NO. TREATMENTS BEFORE ANY IMPROVEMENT		AVERAGE NO. BEFORE ANY IMPROVEMENT	RESULTS
		MIN.	MAX.		MIN.	MAX.		MIN.	MAX.		
Foul lochia, endo- and myometritis	64	2	12	5.3	5	30	9.6	4	14	6.8	60 Satisfactory 4 No change
Subinvolution of uterus	8	1	4	2.1	2	12	4.7	2	4	2.8	7 Favorable 1 Dilatation and curettage for retained secundines
Dysmenorrhea	10	1	1	1.0	1	2	1.4	1	2	1.4	6 Complete relief 4 None
Myalgias	16	1	6	2.8	1	8	3.9	1	8	3.0	14 Marked to complete relief 2 No relief
Breast abscess	12	1	5	3.6	3	15	6.6	3	10	5.4	7 Incised and drained 2 Spontaneous drainage 3 Cleared without incision
Phlebitis	10	9	28	14.2	16	36	21.4	1	19	7.2	9 Relieved completely 1 Improved

that if heat could be applied adequately, safely, and easily, much benefit would be derived. It was decided to use short-wave therapy in such conditions as might conceivably benefit from tissue heat and the physiologic tissue changes resulting therefrom, and a course of therapy planned. All of the treatments were given on patients in the hospital and given under careful supervision and observation. Accurate records were kept, not only of the time intervals, the number of treatments, the obvious effect as determined from the clinical chart, and the eventual outcome, but also of the patient's response to this type of therapy so far as it concerned her subjective symptoms and most especially, pain relief. Many of the early treatments were given by one technician, although no highly trained operator is needed. The procedure was applied in different conditions encountered where application of heat might be expected to arouse local or general beneficial response. Nothing was expected over and above the ability of the modality to produce heat in the area treated.

RESULTS

Sixty-four patients who presented as the outstanding symptom infected and foul lochia, were observed and treated with short-wave therapy. Many of these were accompanied by tenderness of the uterus, and several were complicated by very high temperature and pelvic pain. Upon instituting short-wave therapy, it was noted that there was a marked increase in the lochia after the first or second treatment, subsequent to which there was a rapid or gradual change to normal. Where pelvic pain and uterine tenderness had been an outstanding symptom, the patient invariably reported symptomatic improvement. The foul lochia cleared in all but 4 of these 64, and in 2 cases the patient's condition progressed to general sepsis.

Seven of 8 cases of subinvolution of the uterus responded promptly to therapy, although 3 patients had been treated by the usual oxytocics without response. In one case there was a marked increase in bleeding amounting to hemorrhage, and this patient was subsequently found to have a large intrauterine piece of retained placenta.

In 10 cases of dysmenorrhea treated, the results were less startling. Mindful of the many possible causes of dysmenorrhea, it is not surprising that 4 failed completely of relief. None of these 4 showed gross pelvic abnormalities to account for the dysmenorrhea. In the 6 patients who had complete relief, the pain recurred in 4 at subsequent menstrual periods. However, in 3 of these 4 repetition of the treatment again effected temporary relief.

The most constant results were obtained in myalgias of the extremities, back, and neck, where the response was early and permanent and with a minimum number of treatments. These were in keeping with our knowledge of the response of myalgias of various forms to any type of heat therapy, wherein the amelioration of pain and tenderness depends largely upon heat effects of counterirritants, plasters, poultices, and similar forms of tissue heating applications.

The 12 cases of breast abscess recorded gave better results than the figures indicate. Seven of these came to incision and drainage, but the subsequent course could be fairly described as being less painful and associated with more rapid convalescence than one would ordinarily expect. Two cases ruptured before incision was made during the course of treatment, and in each instance there was a rapid

subsidence in the infective reaction in the breast itself. In three instances inflammatory conditions in the breast, diagnosed clinically as breast abscess and showing marked tenderness, redness, induration of tissue, pitting edema of the overlying skin, and systemic reaction in the form of fever and headache, subsided after persisting treatment without incision and drainage and gave no subsequent trouble.

Ten patients with phlebitis were treated and clinical cure effected in 9 of these 10. The average period of disability was not much shorter than with other forms of therapy, but the relief to the patient came earlier and was more definite and lasting than those observed and treated by other methods. Analgesics were dispensed with in nearly all cases after the third treatment.

There was no increase in systemic temperature in any of the cases treated at the completion of any given treatment. Where any change in temperature was noted, it was in a downward direction.

COMMENT

The clinical impressions gleaned from this group of cases indicate that short-wave therapy is of real service in gynecology and obstetrics. An understanding of the patient and her condition, complemented by thorough appreciation of the physiologic changes induced by such treatment, is imperative before instituting therapy. The prompt and favorable response of the patient and the amelioration of pain in such diverse conditions as parametritis, myalgia, and phlebitis are too definite to be lightly dismissed. There were no untoward reactions nor complications due to the use of short-wave therapy in any of the cases observed, including those in which no benefit was obtained. The meter length of the short wave used seemed to be of no clinical importance. There was no change in systemic temperature. Frequently, there was a marked improvement in the patient's general condition which was difficult to ascribe to the treatment; the intervention of psychic factors frequently plays a rôle in therapy of this form.

The ease of application is notable. In all forms of pelvic pathology requiring treatment, the transabdominal application of pads was used. Many of the myalgias may be treated by the condenser field method using pads but in general are more conveniently managed with the inductive cable applicator. Both methods were used in this series. The reaction of the patient to this form of therapy is extremely interesting. Although at first a few were fearful, the majority were tremendously interested and almost invariably liked the treatment. The early pain relief undoubtedly accounted for the patients' favorable mental response.

The brief treatment time, which averages but fifteen minutes, the ease and safety of application offer advantages not to be found in other forms of heat therapy. No specially trained personnel is needed. There is scant danger of contact or spark burns with pads transmitting wave lengths under 20 meters, although accumulations of perspiration drops

under condenser-field pads is guarded against by interposing an absorptive cloth.

The treatment time averaged fifteen minutes, the frequency one to three times a day. Treatments were continued until relief seemed permanent or until it was felt that persistence in heat therapy was useless. Beneficial effects were noted in from two to seven treatments. Excepting phlebitis, those conditions responding favorably required five days or less for satisfactory completion of therapy.

SUMMARY AND CONCLUSIONS

1. The theory and principles of short-wave therapy are considered.
2. The practical results in 120 cases are recorded.
3. Rigid adherence to valid indications and careful recording of experiences is urged, to properly evaluate the worth of the modality.
4. For the present, the beneficial results obtained are credited to the deep heat created only. It is not a "cure-all."
5. From our experiences, we believe short-wave therapy an exceedingly important method of treating certain gynecologic, postpartum, and postoperative conditions. We regard it as a valuable adjunct to present therapy.

39 Gifford Avenue

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